

We claim:

- 1 1. A method for fabricating a tapered optical coupling into a slab waveguide
2 comprising:
3 providing a sputtering source;
4 providing at least one mask between said source and said mask;
5 disposing a tapered layer of material onto a substrate which includes a
6 waveguiding layer by means of shadow deposition defined by said sputtering source
7 and said at least one mask, said tapered layer extending in a first two dimensional
8 plane and optically coupled to said waveguiding layer; and
9 photolithographically defining a second taper in said tapered layer, said second
10 taper extending in a second two dimensional plane intersecting said first two
11 dimensional plane.
- 1 2. The method of claim 1 where photolithographically defining a second taper in
2 said tapered layer defines said second two dimensional plane so as to
3 perpendicularly intersect said first two dimensional plane.
- 1 3. The method of claim 1 further comprising photolithographically defining a slab
2 waveguide in said waveguiding layer simultaneously with photolithographically
3 defining a second taper in said tapered layer.

1 4. The method of claim 3 further comprising coupling said slab waveguide to a
2 photonic crystal.

1 5. The method of claim 4 where coupling said slab waveguide to said photonic
2 crystal comprises forming said slab waveguide integrally with said photonic crystal.

1 6. The method of claim 1 where disposing said tapered layer of material onto said
2 substrate comprises disposing said tapered layer by means of shadow deposition
3 defined by said sputtering source and said at least two masks.

1 7. The method of claim 1 where disposing said tapered layer of material onto said
2 substrate comprises disposing polycrystalline silicon.

1 8. The method of claim 1 where disposing said tapered layer of material onto said
2 substrate comprises disposing a material with an approximately matching refractive
3 index to said waveguiding layer.

1 9. The method of claim 1 further comprising repeating said method on an opposing
2 side of said substrate to form another tapered optical coupling on said opposing side
3 aligned with said tapered optical coupling.

1 10. The method of claim 1 further comprising first forming a tapered substrate
2 by means of shadow deposition and then forming said tapered optical coupling on
3 said tapered substrate to obtain a fully flared, funnel-shaped, optical coupling.

1 11 A tapered optical coupling comprising:
2 a substrate;
3 a slab waveguide on or in said substrate; and
4 a funnel-shaped termination on or in said substrate and optically coupled to said
5 slab waveguide.

1 12. The apparatus of claim 11 further comprising a photonic crystal and where
2 said photonic crystal is optically coupled to said slab waveguide.

1 13. The apparatus of claim 12 where said slab waveguide is integral with said
2 photonic crystal.

1 14. The apparatus of claim 11 further comprising an optic fiber and where said
2 funnel-shaped termination is optically coupled to said optic fiber.

1 15. The apparatus of claim 11 where said funnel-shaped termination is formed
2 by shadow deposition.

1 16. The apparatus of claim 11 where said funnel-shaped termination is
2 composed of material having an index of refraction approximately matching said slab
3 waveguide.

1 17. The apparatus of claim 16 where said funnel-shaped termination is
2 composed of polycrystalline silicon.

1 18. The apparatus of claim 17 where said slab waveguide is composed of
2 GaAs.

1 19. The apparatus of claim 11 where said funnel-shaped termination is a half-
2 funnel shape.

1 20. The apparatus of claim 11 where said funnel-shaped termination is a full-
2 funnel shape.

1 21. The apparatus of claim 11 where said funnel-shaped termination
2 comprises a surface for optical coupling inclined with respect to said substrate.